THE DISTINCTIVE FEATURES OF ONLINE LEARNING AND LEARNING USING DISTANCE LEARNING TECHNOLOGIES IN EXTREME PANDEMIC CONDITIONS. CASE STUDY: APPROACHES TO ASSESSING THE DISTANCE LEARNING EFFECTIVENESS

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Abstract

In the face of the proliferation of COVID-19, most universities and colleges, with the recommendation of the Ministry of Science and Higher Education of the Russian Federation, decided to switch to emergency remote education. The urgent transfer to distance learning during the pandemic has significant differences from massive open online courses (MOOCs).

Well-organized online learning is meaningfully different from courses offered online in response to a crisis/disaster. Educational organisations are forced to work with students remotely to reduce the risks of coronavirus spread and should be aware of the difference when assessing the effectiveness of so-called "online learning" using digital learning technologies. Universities working to maintain instruction during the COVID-19 pandemic should understand those differences when evaluating this emergency remote teaching.

In this regard, all face-to-face classes, including lectures, practical, and even laboratory classes with virtual analogy, were transferred to the online environment. Teachers are forced to organise the educational process through distance learning technologies based on various methods of delivering electronic content and available communication tools for students and teachers in the electronic information and educational environment (EIE). Such a sharp transition to "distance learning" is a forced and urgent measure, not all universities were ready for this radical restructuring of the educational process based on objectively different levels of information infrastructure development, provision of disciplines with electronic educational resources and the readiness of teachers to use digital platforms and services in the educational process.

The stressful situation for all participants cannot affect the attitude towards online learning and other distance educational technologies. At the same time, the term "online learning" itself is used every time regarding the lack of face-to-face contact with the teacher, which leads to the concepts' substitution and incorrect conclusions. In this situation, it would be unreasonable to use the term online learning even in relation to the use of massive open online courses, since the emergency students' transfer to them in the middle of the semester without preliminary organisational measures and proper support from the authors of online courses does not allow students to fully experience the benefits of this technology. In this regard, it is essential now to understand the concepts and determine the differences between online learning and educational technologies used in the context of emergency university transition to distance learning.

Understanding the differences between online learning and other existing educational technologies, such as distance learning, blended learning, mobile learning, etc., allows for a comparative analysis of the effectiveness of learning in different formats and to analyse the advantages and disadvantages of a particular technology. Unfortunately, scientific discussions are often closed and research results do not go outside the scientific community. However, it can be stated with confidence that the experimental studies carried out in Russia have proved that the effectiveness of online education is not lower, and in some cases even surpasses traditional full-time education in terms of educational results. Thus, what is this educational technology? What determines the effectiveness of online learning? And why should this technology be distinguished from distance learning in extreme conditions?

Keywords: Online learning, educational technologies, distance learning, blended learning, mobile learning, comparative analysis of the effectiveness.

1 INTRODUCTION

Well-planned online learning experiences are significantly different from courses offered as emergency distance education in response to the threat of COVID-19. Universities working to maintain instruction during the COVID-19 pandemic should understand those differences when evaluating this emergency remote education [1]. Due to the threat of COVID-19, universities are facing tough decisions about how to continue the educational process while keeping their faculty, staff, and students safe. Many universities have chosen to terminate all face-to-face (F2F) lectures, including workshops and other learning experiences, and have mandated that faculty move their courses online to help prevent the spread of the COVID-19. The list of universities making this decision has been growing each day [2].

- 31% of students are unhappy with educational programs and consider them obsolete;
- 55% of students say universities offer little practice;
- 41% of students noted the distance between education and labour market requirements;
- 91% of employers say university graduates lack practical knowledge and skills;
- 21% of teachers use online courses in their disciplines

Moving to remote education can enable teaching flexibility and learning “on the fly” but the speed with which this move to remote education is expected to happen is exceptional and shocking. Although technical support, personnel and teams are ready to help and implement online education [3]. In the present situation, these individuals and teams will not be able to offer the same support level to all faculty in such a narrow preparation time. No matter how clever a solution might be, many instructors will understandably find this process stressful. In assessing the effectiveness of the new educational technology, it is tempting to compare the learning outcomes using the technology with those of the traditional F2F model and distance education [4]. However, such a comparative analysis generally does not provide a valid statistically significant conclusion of:

- the rigorous experimental design;
- the identical content and different content format;
- the same measuring and control materials and final certification conditions;
- the sufficiently large sample, randomly selected for each learning model(s);
- the external factors influence on the experimental results;
- The validity of the experiment.

In addition, the analysis defines performance as student performance and does not take into account other success factors. Success is not an absolute category and can be measured by the interests of different participants in the learning process [5]. For educators, these are the students' education results, and for students, apart from their academic performance, motivation and involvement in the learning process play an important role, which directly influence students' achievements as well. The percentage of students who complete the course, the reduction of educators’ workload and productivity, market coverage, and the extra-budgetary funds raised are of primary importance to the university administration [6].

For the Ministry of Science and Higher Education, the emphasis is shifted to the education quality, human resource availability and IT infrastructure reliability, the global competitiveness of education, and the implementation of national and federal project indicators [7]. The assessment of the online learning effectiveness or the use of distance education technologies may be carried out through the lens of these targets but with new education models [8, 9]. In the extreme circumstances because of the educational process with limited internal and external resources, very different evaluation criteria have come to the fore. They can be divided into four areas:

1 context(s) change assessment;
2 the feasibility and cost-effectiveness change assessment;
3 the processes and results(s) change evaluation;
4 Direct and by-product change evaluation.

Therefore, to assess the current forced transition to distance education, universities will have to answer the following questions:

1 What factors (social, institutional, administrative) have determined the universities' readiness for transition, the participants' attitude to change and affected the effectiveness of these changes?

2 Are internal and external resources sufficient for such a transition? In particular, is the level of IT infrastructure development sufficient to support the changes? Do staff and teachers have the necessary competence to carry out their tasks?

3 Which phases of the transition process have caused the greatest difficulties for the participants? What institutional arrangements have failed?

4 What are the results of distance education for students, educators, and technical support staff? What is the reason for nonachievement of objectives or negative feedback from participants? What issues need to be addressed to improve results?

Such an assessment is more focused on the prerequisites, analysis needs, and processes than on the results' evaluation. Efficiency is then defined as the results ratio to the resources spent, taking into account the urgency of the task. In the final analysis, it is more important to draw conclusions from this "global experiment" and to organize systematic work on errors to avoid these errors in the future [10].

2 METHODOLOGY

The analysis used data from sociological research on students' and educators' attitude to remote education during a pandemic, analytical and information material of university bibliographic sources.

Secondary analysis and results interpretation of the sociological surveys, systematization and classification, management analysis and the universities' experience in the context of extreme remote transitions, including in comparison with foreign universities were carried out.

3 RESULTS

In connection with the transition to emergency remote education, it is important to assess the main opportunities, prospects, and challenges. Emergency remote education is a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances, which involves fully remote teaching solutions for education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated [10]. The primary objective is to provide temporary access to education in a manner that is quick to set up and is reliably available during an emergency. When we understand emergency remote education in this manner, we start to divorce it from "online learning". There are many examples of other countries responding to university closures in a time of crisis by implementing models such as mobile learning, radio, blended learning, or other solutions that are contextually more feasible [11].

When we observe the educational planning in crises, it is obvious that these situations require creative problem solving: we have to be able to generate various possible solutions that help to meet the new needs of our learners and in most cases, it might even help us to generate some new solutions to intractable problems. Thus, it may be tempting to think about emergency remote education as an essential approach to standard instruction. In reality, it is a way of thinking about delivery modes, methods, and specifically as they map to rapidly changing needs and limitations in resources, such as faculty support and training [12].

In the current situation, the technical support teams will not be able to offer the same level of support to all faculty who need it. Technical support teams play a critical role in the education experience by helping faculty members develop face-to-face or online learning experiences. Current support models might include full-course design support, professional development opportunities, content development, learning management system training and support, and multimedia creation in partnership with faculty experts [13]. Faculty who seek support typically have varying levels of digital fluency and are often accustomed to one-on-one support when experimenting with online tools. The shift to emergency remote education requires that faculty take more control of the course design, development, and implementation process. With the rapid development of emergency remote education and the large number of faculty in need of support, faculty development and support teams must find ways to meet the institutional need to provide instructional continuity while helping faculty develop skills to teach in an online environment. As such, institutions must rethink the way instructional support units do their work, at least during a crisis [13].

The quick approach for emergency remote education may reduce the course quality. A full-course development project can take months when done properly. The need to " move it online" is in direct contradiction to the time and effort dedicated to developing a quality course. Emergency remote courses created in this way should not be mistaken for long-term solutions but accepted as a temporary solution to an immediate problem [14]. Especially regarding the degree to which the accessibility of educational materials might not be addressed during emergency remote education; the universal design for learning should be part of all discussions around education. Universal design for learning principles focus on learning environments designs that are flexible, inclusive, and student-centered to ensure that all students can access and learn from course materials, activities, and assignments [14].

The move towards remote education due to the pandemic has helped universities, educators, students, policymakers to see new opportunities and gain new positive experiences which will certainly benefit universities. Most importantly, educators, especially of the older generation, have overcome some of the barriers that they faced regarding digital educational technologies that they could not overcome in other contexts. The uploading of lectures on the platform allows teachers to free themselves from reading and devote this time to research work and lecture material improvement, which allows students to learn with less effort the material that is posted on the platform and given with the help of webinars, which at the same time facilitates the selection of the best teaching materials.

The requirements for educators are already being redefined, their status and work values are being reevaluated, and educational programmes (disciplines) are being further adapted to current realities: full or partial online implementation, expansion by leading teachers on a remote basis, systematic support measures development for educators and students.

3.1 Forms and technologies of emergency remote education

The almost instantaneous transition to emergency remote education first required several radical changes in the educational process organization:

- postpone to the next academic year courses that cannot be delivered remotely;
- create conditions for the individualization of educational trajectories, taking into account significant changes in the individual circumstances and the education environment;
- Transfer the instruction for each course into one of two modes: (1) internal study mode «remote» or (2) external study mode.

As early as March 2020, it became clear that in every fifth university there are courses that cannot be completed remotely [15]. For some courses, it was decided to postpone to the next academic year. Overall, at the end of May 2020, a fifth (20%) of students noted that in some disciplines classes had been completely cancelled [16]. Among them, it is possible to distinguish several groups of training directions:

- majors in which special equipment or laboratories are required (e.g., “Chemical Technology”, “Technological machines and equipment”, “Clinical medicine”);
- creative major (e.g., “Music and Instrumental Art”, “Music-Applied Art”);
- majors of social infrastructure (e.g., “Pedagogy”, “General Medicine”).

The curriculum individualization during the COVID-19 pandemic could be a major option for students and universities, as has happened in many countries. This was hampered by the fact that the transition to an emergency remote format occurred almost in the middle of the semester and by the existence of regulatory barriers to such individualization [17]. Students do not mention individual study plans.

Of course, the most significant change was the application of two basic models of educational organization. In most universities, regular instruction was organized in most subjects (often on the same timetable), only in remote mode. With the introduction of telecommuting, the educators began to put in their subjects’ materials necessary for the study and to conduct seminars broadcast on the Internet, and used synchronous technologies to increase student involvement and interactivity.

However, another group of universities, lacking a developed digital education environment, used mostly asynchronous teaching technologies when students were sent out assignments and then the completed works were collected for checking by e-mail.

- 55% have received only a list of literature recommended for self-study in at least one discipline (15% say that this format is chosen by the teachers of all subjects they study).

One of the fastest and most resource-efficient solutions to the transition to remote education has been the active use of ready-made online courses in the learning process.

- 28% of educational programmes were partly or fully implemented using courses presented on online platforms (more in bachelor's programmes).

A number of universities have opened public access to their online courses. Such courses have been published on online platforms, on specially created digital resources, or on sections of official sites. Platforms such as "Coursera", "Open Education" were also opened to access their online courses [18].

However, the increase in the use of online courses as a complete replacement for was relatively small: in the first two weeks - twice, and at the end of the period - three times. Resources were used more intensively for the design of own activities - commercials of "PostScience" and "YouTube", collection of tasks and other open resources. According to the survey, very little use was made of paid libraries [19]. In synchronous education, digital communication was used extensively.

- 57 % of students were taught by videoconference which was actively used by universities;
- Between March and May, the proportion of students without subjects who are taught through video communication programmes has more than halved (from 41% to 17%).

It is important that the increase in the number of subjects taught in this format has occurred in different types of universities (not only in the leading ones). A common feature of universities with a synchronous and asynchronous educational regime is a sharp increase in independent students' work.

- 95% studied the teaching materials sent by the teachers themselves.

However, none of the students mentioned that the universities were helping them to organize their own digital activities. Students were not offered tools to organize educational work, systematize sources and materials;

- 53% of students used digital learning management systems to organize their own educational work, indicating that these systems are not sufficiently functional.

Unavailable digital assets, digital libraries have also become a challenge.

- 49% of universities are fully equipped with digital library resources in all educational programmes;
- 11 % of these resources can be integrated with foreign databases.

Remote formats have intensified the implementation of new technology solutions in the field of assessment. The first remote defences of graduate qualification work with the use of this technology became more active. Single universities have launched their own monitoring systems. It turned out that in the Russian market there is almost no competition of suppliers of this important service, and the available is costly [20].

Most of the teachers noted the serious lack of digital assessment tools as a serious constraint. Their development and use are still rare cases in our higher education system. However, only a few universities used big data analysis and digital tracking systems to analyze and evaluate student educational results [21].

3.2 Digital infrastructure of Russian universities

Of course, in a pandemic environment, significant and rapid improvements in infrastructure were not possible. Therefore, the Ministry of Education and Science and leading universities have chosen a strategy to actively mobilize existing digital educational platforms, as well as digital service providers, to support universities that do not have the infrastructure to organize the remote educational process [22].

- 13% of universities lack even minimal infrastructure (no high-speed Internet access, no specialized data storage systems for information systems);
- 44% of universities had licenses for synchronous collaborative software (ZOOM type);
- 11% of universities have a digital infrastructure sufficient to provide full-time online learning and to host content with their own capacity;

- 88.51% of dormitories were connected to the Internet;
- 88% of universities have digital learning management systems (LMS);
- 45% of universities have indicators that correspond to the real use of LMS for educational activities

In general, the higher education system has been able to create conditions for the provision of remote education for the students' majority. However, in the context of the transition to a remote education format, there are clearly significant differences in the state of the digital infrastructure of universities: the availability and performance of storage systems and Internet access channels, services, and information systems required to effectively organize the education process in a digital environment.

Two significantly different approaches to the organization of the digital infrastructure of remote education in universities appeared [23]:

1 Formation and promotion of a single set of technological solutions to provide remote education at the university level based on own digital infrastructure and/or centralized cloud service subscription. As a rule, this was accompanied by special training, a single support system. This approach has made it possible to achieve scale economies and to create a common space for the practices' exchange. It was not entirely comfortable for teachers who had already had experience with the active use of digital services - themselves - they had to redevelop.

2 Provide a choice of digital tools and approaches to remote education for university teachers, use of open tools by teachers without centralized coordination, but with individual support. This approach has stimulated each teacher's search for convenient digital services, an active position in the development of new competencies.

A special study is required to assess the comparative effectiveness of these approaches. Key resource mobilization challenges included:

- the lack of individual tools and equipment, and the Internet's weakness in teachers' and students' home offices;
- lack of licenses and experience with videoconferencing;
- lack of collaborative tools (including joint training).

Among the universities, the main solutions for the development of their own digital infrastructure in this period can be highlighted:

- rapid scaling and implementation of information systems and services (LMS-systems, videoconferencing organization, and teamwork systems) are already available in universities, but working in separate departments or in a test mode;
- increase the performance of cloud services used for mass distance learning (transition to higher fees, purchase of additional licenses);
- teacher and employee assistance (methodical and sometimes resource-based) to complete the individual technological infrastructure;
- centralized acquisition of access to cloud services (Zoom, MS Teams, etc.);
- increased performance of Internet access channels, etc.

3.2.1 Process and procedures: modes of organizing educational activities

While not all processes and procedures used by universities before the pandemic have functioned as effectively as before, the system as a whole has remained stable. The scale of the task is indicated by a simple figure - it was necessary to implement in the "remote" format of more than a million courses (disciplines), including lectures, seminars, and practical exercises. The vast majority of the courses were held on time and were not rescheduled for other semesters. Cases of complete suspension were rather an exception to general practice.

The transfer of millions of students and tens of thousands of employees to a remote format of work has made it possible to significantly increase the effectiveness of the measures against the spread of the coronavirus pandemic. Most of the universities restructured work and kept the students involved in educational activities - students interacted with teachers, carried out teaching tasks and projects. The readiness of almost all university establishments to mobilize and operate under the new regime has made it possible to maintain a

sense of stability for students and teachers. An analysis of university practice shows that during the period of long-distance work, several modes of organizing educational activities have developed [20]:

- asynchronous or absentee (students study the material at their convenience, according to the teacher's timetable);
- synchronous (simultaneous participation in the session, e.g., webinar);
- mixed (combination of synchronous and asynchronous interactions depending on pedagogical tasks).

To a large extent, the differences in these regimes reflected the strong internal differentiation of the higher education system in the context of the pandemic. The average response of the system as a whole should not hide the fact that a large proportion of students have actually been transferred to remote education, the infrastructure and digital expertise of a number of universities have not been sufficient to move effectively to a remote format [19]. This shows that a number of higher educational establishments are lagging behind modern requirements in the management and organization of the educational process. Consequently, the experience of recent months has shown the wide scope for the use of remote working formats and technologies to meet not only the traditional but also the new needs of universities. The experience of the «remote» universities also showed not only the possibilities of digital technologies, but also their limitations [24].

1 It has become clear that the effective use of technology requires special competencies of teachers and students, as well as efficient and convenient technological solutions and special organization of the educational process. Without this, one cannot speak of a full-mode remote education.

2 The situation has confirmed that some of the most important processes of university life are not easily digitized, transferred into virtual space. In practice, it is impossible to fully implement distance-based higher education programmes.

Thus, the future lies in the widespread use of digital technology and remote formats, combined with teamwork between teachers and students in a common physical space [17]. Awareness of the new possibilities and technological limitations of universities, arising from the analysis of this extreme period, should make it possible to take a new step towards increasing the competitiveness of Russian education.

4 CONCLUSIONS

It is clear that remote education will not replace classical face-to-face education, but it is more likely that there will be a large-scale transition to blended learning, where digital educational technologies will find their place in different aspects. In this connection, further research work will be required to move away from the rigid formalization and standardization of the educational process and towards various forms of free education and individual educational trajectories, network education [8].

1 It is necessary to rethink investments in the digital infrastructure of universities. In the long run, we can reduce the requirements for mass provision of education with computer equipment (computer classes) and data storage and processing equipment. The needs of universities can be effectively met by using cloud storage infrastructure and cloud-based systems to organize and support the learning process, as well as by moving to the concept of personal devices for students and teachers (with the support of students who are not able to purchase personal devices with the necessary functionality). The priority for universities should be the development of wireless high-speed Internet access networks.

2 During the educational process in a remote form, there were serious difficulties with ensuring information security, which highlighted systemic problems and insufficient attention on the part of most universities to ensure the protection of physical infrastructure and systems from external threats, as well as the preservation of personal data. There is a need for relatively low-cost, scalable technology solutions to ensure security in a digital environment.

3 The poor and underdeveloped market of system products and services for the Learning Management System (LMS), Education Management System (EMS), and Virtual Learning Environment (VLE), which provide the effective operation of the university, is evident [28]. Universities alone cannot develop comprehensive, scalable high-end solutions, therefore is necessary to join efforts with technological companies, to move universities to the position of

qualified customers and to stimulate the competitive services creation - possibly through grant competition with potential suppliers.

4 It is impossible to form an expert examination in each university to choose the best technological solutions in the field of digital transformation of the educational process. In this selection, a collective user experience, a collective system of recommendations, and quality assessment of services that can be provided by the higher education community with the support of the regulator can provide significant assistance. It is also possible to significantly optimize costs by building collaborations with other universities and organizations through the creation of common infrastructure elements, service, and purchase of collective licenses.

5 The current situation has also made it possible to test many technical solutions and improve the software of various Internet-based training platforms, which became clear which parts of the learning process can be conducted online and which require face-to-face interaction. Experience has shown that remote technology will fit into modern educational programmes and the main thing here is to find the right balance of traditional physical and remote formats [25].

6 A significant part of the traditional university program can be effectively implemented in an face-to-face format outside the university auditorium. It is important not to miss these opportunities when returning to the normal learning process and remove the regulatory barriers to their use [29]. Moreover, these opportunities need to be reflected in FSES (Federal Educational Standard).

7 During the remote work, the request for digital didactics became evident [26]. Traditional (front-line) practices were transferred online without regard to its specifics, which reduced the training effectiveness, while part of online education tools, due to lack of demand and experience of use, appeared to be in no demand.

8 A programme is needed to develop the digital tools and content needed to organize and conduct online workshops, virtual laboratories, simulations, virtual, and augmented reality.

9 A serious problem was the lack of online assessment of students' educational results. Examination sessions, diploma work defended in universities have so far been conducted only in person, but there has been no experience of mass use of the proctoring system. There is a need to expand the application of qualitative and objective online assessment tools.

10 It is necessary to establish networks of internship sites based on consortia of universities, scientific organizations, and businesses to disseminate new education practices and enhance faculty skills [27]. The most effective mechanism for spreading innovative practices is not the order or even the methodical recommendations of regulators, but the successful precedents of the best practices themselves.

At the same time, two different trends are expected to influence further post-pandemic development of digital education:

- a large proportion of universities have learned and adapted to the new realities of distance education, have learned lessons, and are now much better prepared to take advantage of digitization, seeing it as a promising one [28];
- In view of the forced, sudden, unprepared mass transition to distance education associated with self-isolation and significant social constraints that have lasted for several months, the digital format of education has been influenced by negative factors, met with little support at the beginning, and has now accumulated a certain fatigue on the part of participants in the educational process [28].

This may lead to a certain degree of rejection of its further development by a large part of the university community. This is further evidenced by the recent intensification of discussions on the appropriateness and effectiveness of digitizing a large proportion of education.

At the moment, it is difficult to make a final and complete assessment of the impact and effectiveness of digital education and collaboration in a pandemic. It is clear that the activities of the state authorities, the relevant ministries, and the university community during the pandemic have demonstrated that close coordination, clear linkages, and sound operational management are essential.

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